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Bulletin I2105 rev. D 12/98

International
IOR Rectifier

SAFEIR Series
16TTS..S

SURFACE MOUNTABLE PHASE CONTROL SCR

V_T < 1.4V @ 10A
I_{TSM} = 200A
V_{RRM} = 800 to 1600V

Description/Features

The 16TTS..S *SAFE**IR*** series of silicon controlled rectifiers are specifically designed for medium power switching and phase control applications. The glass passivation technology used has reliable operation up to 125° C junction temperature.

Typical applications are in input rectification (soft start) and these products are designed to be used with International Rectifier input diodes, switches and output rectifiers which are available in identical package outlines.

Output Current in Typical Applications

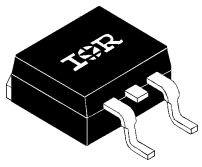
Applications	Single-phase Bridge	Three-phase Bridge	Units
NEMA FR-4 or G10 glass fabric-based epoxy with 4 oz (140µm) copper	2.5	3.5	A
Aluminum IMS, R_{thCA} = 15°C/W	6.3	9.5	
Aluminum IMS with heatsink, R_{thCA} = 5°C/W	14.0	18.5	

T_A = 55°C, T_J = 125°C, footprint 300mm^2

Major Ratings and Characteristics

Characteristics		16TTS..S	Units
$I_{T(AV)}$	Sinusoidal waveform	10	A
I_{RMS}		16	A
V_{RRM}/V_{DRM}		up to 1600	V
I_{TSM}		200	A
V_T	@ 10 A, T_J = 25°C	1.4	V
dv/dt		500	V/µs
di/dt		150	A/µs
T_J		- 40 to 125	°C

Package Outline



D^2 PAK (SMD-220)

Voltage Ratings

Part Number	V_{RRM}, maximum peak reverse voltage V	V_{DRM}, maximum peak direct voltage V	I_{RRM}/I_{DRM} 125°C mA
16TTS08S	800	800	10
16TTS12S	1200	1200	
16TTS16S	1600	1600	

Absolute Maximum Ratings

	Parameters	16TTS..S	Units	Conditions
$I_{T(AV)}$	Max. Average On-state Current	10	A	@ T_C = 98° C, 180° conduction half sine wave
I_{RMS}	Max. RMS On-state Current	16		
I_{TSM}	Max. Peak One Cycle Non-Repetitive	170		10ms Sine pulse, rated V_{RRM} applied
	Surge Current	200		10ms Sine pulse, no voltage reapplied
I^2t	Max. I^2t for fusing	144	A^2s	10ms Sine pulse, rated V_{RRM} applied
		200		10ms Sine pulse, no voltage reapplied
$I^2\sqrt{t}$	Max. $I^2\sqrt{t}$ for fusing	2000	$A^2\sqrt{s}$	t = 0.1 to 10ms, no voltage reapplied
V_{TM}	Max. On-state Voltage Drop	1.4	V	@ 10A, T_J = 25°C
r_t	On-state slope resistance	24.0	mΩ	T_J = 125°C
$V_{T(TO)}$	Threshold Voltage	1.1	V	
I_{RM}/I_{DM}	Max.Reverse and Direct	0.5	mA	T_J = 25 °C; V_R = rated V_{RRM}/ V_{DRM}
	Leakage Current	10		T_J = 125 °C; V_R = rated V_{RRM}/ V_{DRM}
I_H	Holding Current	Typ. / Max.	mA	Anode Supply = 6V, Resistive load, Initial I_T=1A
		-- / 100		16TTS08S, 16TTS12S
		100 / 150		16TTS16S
I_L	Max. Latching Current	200	mA	Anode Supply = 6V, Resistive load
dv/dt	Max. Rate of Rise of off-state Voltage	500	V/µs	
di/dt	Max. Rate of Rise of turned-on Current	150	A/µs	

Triggering

Parameters		16TTS..S	Units	Conditions
P_{GM}	Max. peak Gate Power	8.0	W	
$P_{G(AV)}$	Max. average Gate Power	2.0		
$+ I_{GM}$	Max. paek positive Gate Current	1.5	A	
$- V_{GM}$	Max. paek negative Gate Voltage	10	V	
I_{GT}	Max. required DC Gate Current	90	mA	Anode supply = 6V, resistive load, T_J = - 10°C
	to trigger	60		Anode supply = 6V, resistive load, T_J = 25°C
		35		Anode supply = 6V, resistive load, T_J = 125°C
V_{GT}	Max. required DC Gate Voltage	3.0	V	Anode supply = 6V, resistive load, T_J = - 10°C
	to trigger	2.0		Anode supply = 6V, resistive load, T_J = 25°C
		1.0		Anode supply = 6V, resistive load, T_J = 125°C
V_{GD}	Max. DC Gate Voltage not to trigger	0.25		T_J = 125°C, V_{DRM} = rated value
I_{GD}	Max. DC Gate Current not to trigger	2.0	mA	T_J = 125°C, V_{DRM} = rated value

Switching

Parameters		16TTS..S	Units	Conditions
t_{gt}	Typical turn-on time	0.9	µs	T_J = 25°C
t_{rr}	Typical reverse recovery time	4		T_J = 125°C
t_q	Typical turn-off time	110		

Thermal-Mechanical Specifications

Parameters		16TTS..S	Units	Conditions
T_J	Max. Junction Temperature Range	-40 to 125	°C	
T_{stg}	Max. Storage Temperature Range	-40 to 125	°C	
	Soldering Temperature	240	°C	for 10 seconds (1.6mm from case)
R_{thJC}	Max. Thermal Resistance Junction to Case	1.3	°C/W	DC operation
R_{thJA}	Typ. Thermal Resistance Junction to Ambient (PCB Mount)**	40	°C/W	
wt	Approximate Weight	2 (0.07)	g (oz.)	
T	Case Style	D^2Pak (SMD-220)		

**When mounted on 1" square (650mm^2) PCB of FR-4 or G-10 material 4 oz (140µm) copper 40°C/W
For recommended footprint and soldering techniques refer to application note #AN-994

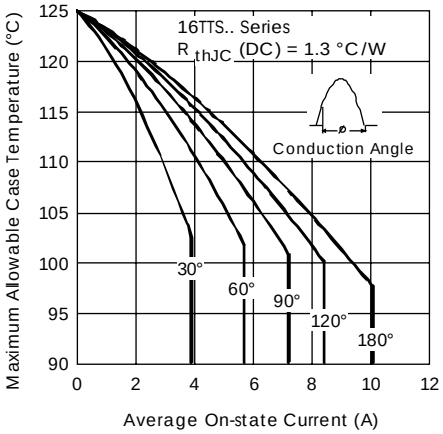


Fig. 1 - Current Rating Characteristics

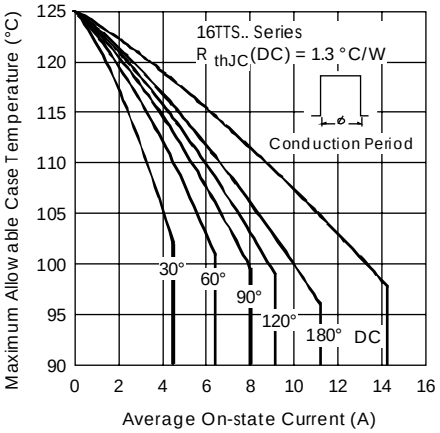


Fig. 2 - Current Rating Characteristics

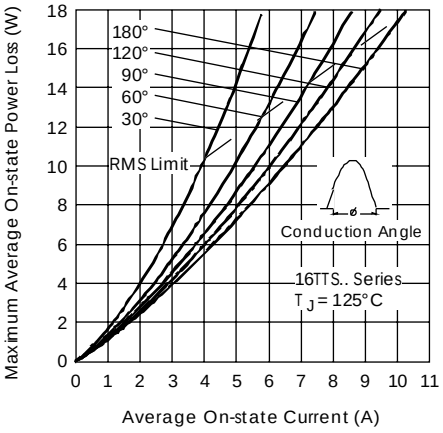


Fig. 3 - On-state Power Loss Characteristics

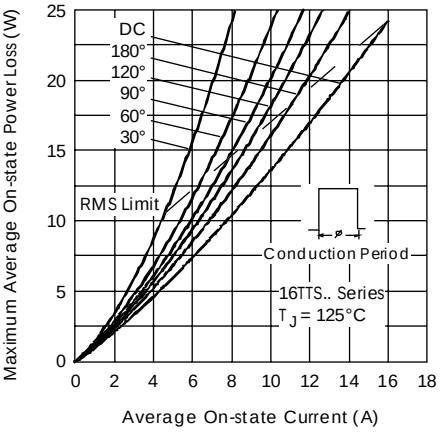


Fig. 4 - On-state Power Loss Characteristics

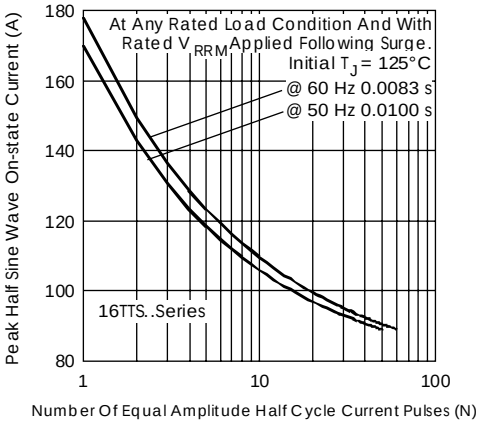

At Any Rated Load Condition And With
Rated V RRM Applied Following Surge.
Initial T J = 125°C
@ 60 Hz 0.0083 s
@ 50 Hz 0.0100 s
16TTS..Series
Peak Half Sine Wave On-state Current (A)
Number Of Equal Amplitude Half Cycle Current Pulses (N)

Fig. 6 - Maximum Non-Repetitive Surge Current

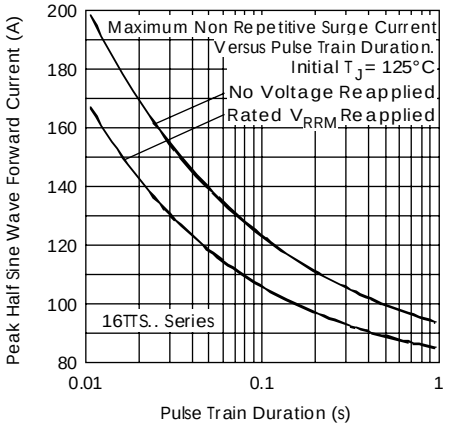

Maximum Non Repetitive Surge Current
Versus Pulse Train Duration.
Initial T J = 125°C
No Voltage Reapplied
Rated V RRM Reapplied
16TTS.. Series
Peak Half Sine Wave Forward Current (A)
Pulse Train Duration (s)

Fig. 7 - Maximum Non-Repetitive Surge Current

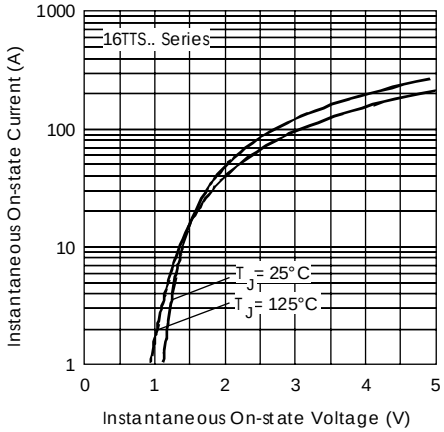


Fig. 7 - On-state Voltage Drop Characteristics

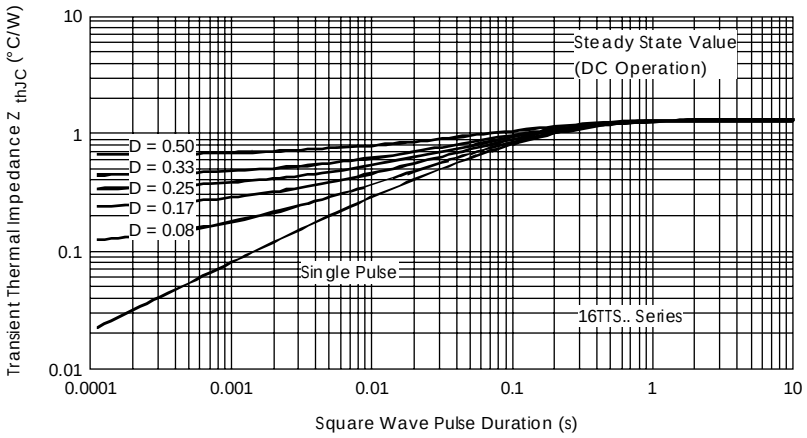


Fig. 8 - Thermal Impedance Z_{thJC} Characteristics

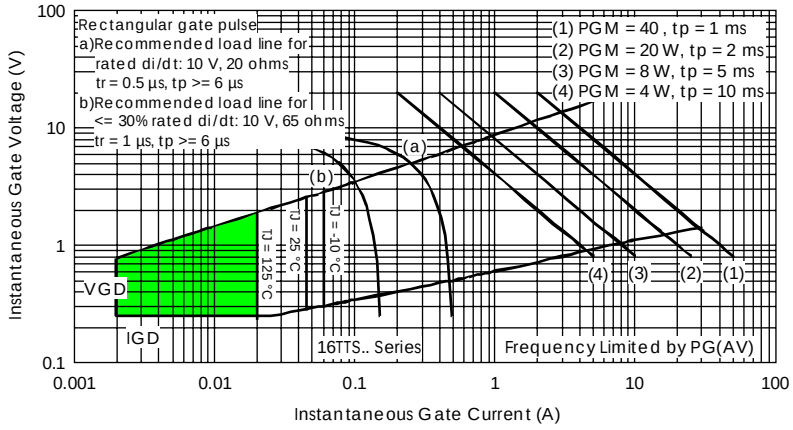
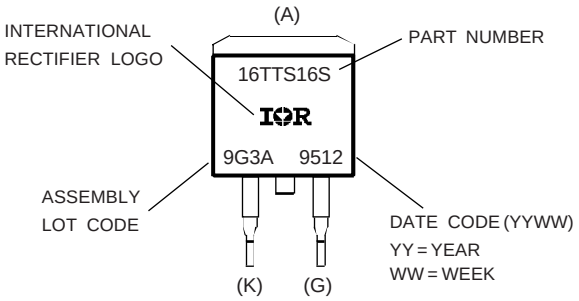


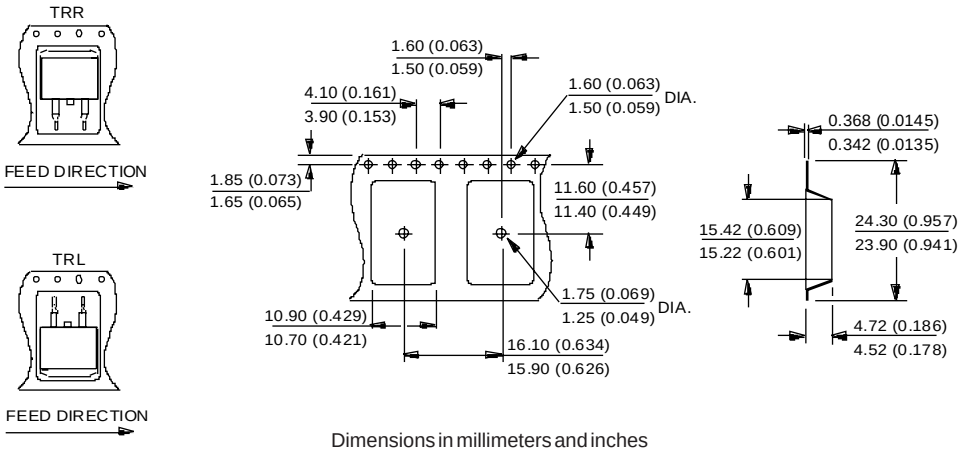
Fig. 9 - Gate Characteristics

Marking Information

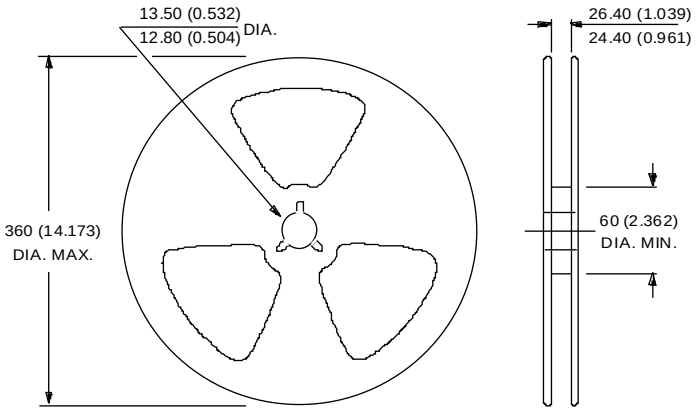
EXAMPLE: THIS IS AN 16TTS16S



Tape & Reel Information

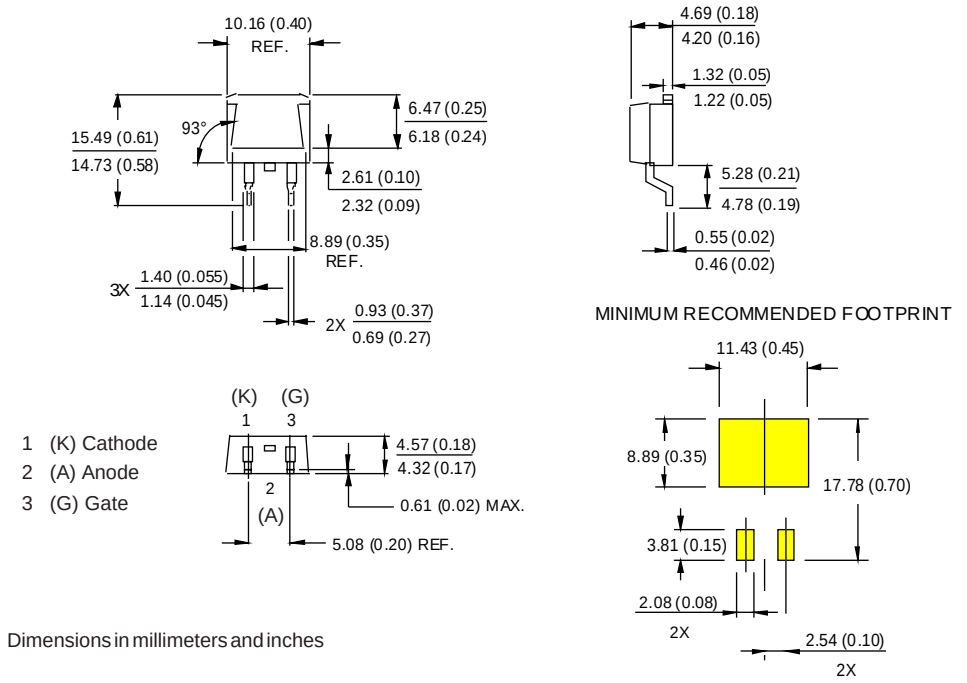


Dimensions in millimeters and inches



SMD-220 Tape & Reel
When ordering, indicate the part number, part orientation, and the quantity. Quantities are in multiples of 800 pieces per reel for both TRL and TRR.

Outline Table

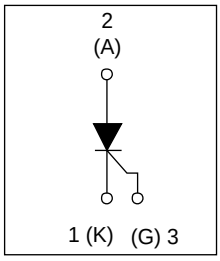


Dimensions in millimeters and inches

Ordering Information Table

Device Code

16	T	T	S	16	S	TRL
1	2	3	4	5	6	7



1 - Current Rating, RMS value

2 - Circuit Configuration
T = Single Thyristor

3 - Package
T = TO-220AC

4 - Type of Silicon
S = Converter Grade

5 - Voltage code: Code x 100 = V_{RRM}

08	=	800V
12	=	1200V
16	=	1600V

6 - S = TO-220 D^2Pak (SMD 220) Version

7 - Tape and Reel Option
TRL = Left Reel
TRR = Right Orientation Reel

International
IOR Rectifier

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IR CANADA: 15 Lincoln Court, Brampton, Markham, Ontario L6T3Z2. Tel: (905) 453 2200. Fax: (905) 475 8801.
IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg. Tel: ++ 49 6172 96590. Fax: ++ 49 6172 965933.
IR ITALY: Via Liguria 49, 10071 Borgaro, Torino. Tel: ++ 39 11 4510111. Fax: ++ 39 11 4510220.
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